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UNITED STATES.

[Reports to the Supervising Surgeon-General, United States Marine-Hospital Service.]

INVESTIGATION INTO THE CAUSE OF YELLOW FEVER.

Preliminary report of medical officers detailed by direction of the President as a commission to investigate in Habana the cause of yellow fever.

[NOTE.—As published in the PUBLIC HEALTH REPORTS of November 12, 1897, Surgeon Eugene Wasdin (then passed assistant surgeon) and Passed Assistant Surgeon H. D. Geddings, who had been engaged in bacteriological study regarding yellow fever in New Orleans, were detailed by direction of the President to investigate in Habana into the cause of yellow fever. Suitable rooms were provided in Habana and a laboratory established, and the work was continued until interrupted by the war. These officers have been directed to return to Habana and continue their investigation, the laboratory having been undisturbed during the war. Following is the preliminary report furnished by each officer.]

SIR: I have the honor to submit the following general summary of the work of the commission appointed by you, with the consent of the President of the United States, for the purpose of investigating the etiology of yellow fever.

Introductory to this, I must mention the work done by me, prior to this detail, in this direction, during the prevalence of the yellow fever along the Gulf coast of Mississippi and Louisiana during October and November of 1897.

In compliance with your directions I had commenced such investigation at Ocean Springs, Miss., during the latter part of September, visiting a number of cases, and securing tube cultures from the living blood. Early in October, through the courteous invitation of Dr. S. R. Olliphant, president of the board of health of Louisiana, and of Prof. P. E. Archinard, bacteriologist to the board, and by your permission, I joined Dr. Archinard in the investigation being conducted by him in New Orleans, where the fever existed. This investigation had been instituted by the authorities of the Charity Hospital, and to Dr. Bloom,

the courteous superintendent and resident surgeon of that institution, I am indebted for the privilege of visiting the isolation division of that hospital, and the valuable opportunity of working in conjunction with the gentlemen detailed for that especial duty. Other than a study of the large number of cases of the disease at this hospital, which I estimate an invaluable experience, I entered actively into the pathologic and bacteriologic work. A detailed description of this work would anticipate the report of the pathologist in the proposed general report of the epidemic by the authorities of the Charity Hospital, since it was assumed that any and all work done would be for the use of that institution. It suffices to state that it was impracticable to make, during the limited continuance of the fever, extensive bacteriologic examination of any individual case, owing to the number of necropsies held during this time; and it was necessary to postpone examination in most cases to a later date, the cultures from the blood and organs being carefully preserved, together with those obtained at Ocean Springs.

I should here refer to the uniform courtesy of the gentlemen who formed the general staff of the isolation hospital, Drs. Veazie, Hamilton, Jones, and Pothier, with whom it was a pleasure to be associated. The bacteriologic work was carried on in the laboratory of the medical department of the Tulane University, under the direction of Professor Archinard, from whom, and the dean of the college, Prof. S. E. Chaille, many courtesies were received by myself and Passed Assistant Surgeon H. D. Geddings, who had joined me in this portion of the work. Upon the receipt of your order on November 11, 1897, to proceed to Habana, and there continue the investigation into the cause of yellow fever, we proceeded to do so as early as practicable, all the culture material, almost entirely obtained from necropsies, little attention having been devoted to fresh blood plantings, being carefully transferred to that city.

Our reception by the Captain-General of Cuba, General Blanco, was marked by a kindness which presaged the most satisfactory arrangements for the conduct of the investigation, and we received an early introduction into the military hospitals of Alphonso XIII, that at Regla, and that of St. Ambrosio. Owing to unavoidable delays the laboratory installation was not completed until near the middle of January, 1898, and from this time until our work was discontinued, on March 16, by your direction, the number of cases of yellow fever was very limited. It was during this period that opportunity was had to thoroughly examine the cultures obtained in the United States. Here I must state that an impetus had been given the matter of etiologic investigation by the Annales de l'Institut Pasteur for June, 1897, of the claim by Prof. Guiseppe Sanarelli, of the University of Montevideo, Uruguay, that he had discovered in his bacillus icteroides the cause of this disease.

The semidetermination of Dr. G. M. Sternberg, U. S. A., that the bacillus X (bacillus cuniculicida Havaniensis), discovered by him in 1889, was the cause of this fever, had been withdrawn (*a*), and the claim of other discoverers negated (*b*), so that it was incumbent upon us to at once ascertain whether the organism which Sanarelli described, the bacillus icteroides, was to be found in the cultures made by me in New Orleans, and, if so, to ascertain, by comparative necropsies, performed upon bodies of those dead from disease other than yellow fever, whether this new organism had been overlooked, or not detected by Sternberg in his justly celebrated work in this field, since he had declared that there was nothing in the blood or organs of yellow fever

a Report on yellow fever; Sternberg, 1890, U. S. M. H. S. *b* Idem.

patients which he had not detected. To this end each case necropsied at New Orleans was patiently and thoroughly plated from young bouillon cultures from the original and subsequent plantings, these originals having been taken from blood, spleen, liver, and kidneys, the portions of organs in many cases having been incubated twelve hours prior to the inoculation of the tubes, as advised both by Sternberg and Sanarelli. Besides these cultures, those taken from living patients at the isolation division of the Marine-Hospital detention camp at Fontainebleau, Miss., were also carefully examined. It was from the blood of one of these cases, "Goodrich," planted on September 28, 1897, that the most typical forms of colonization, to those described by Sanarelli for bacillus icteroides, were noticed, of a small rod, actively (at first) motile; not retaining the stain after Gram; but which later in New Orleans gave rise to the production of indol and the formation of gas with both glucose and lactose. This organism, as at first noted, more nearly resembled that of Sanarelli than any other isolated at the time we left the laboratory at New Orleans, and it was now taken up for more careful observation than had been then possible. For unanimity of purpose it was thought best that each of us should prepare, independently, cultures of each and every specimen on hand, and carry them to a definite termination, a decision which afforded much satisfaction at the termination of the tedious and exacting labor of plating and replating so large a number of organisms, in that while we succeeded in a number of cases in detecting the organism in both sets of cultures, it occasionally occurred that it was found by only one of us in a special one. It is gratifying to say that the organism was readily and quickly isolated by both of us from the "Goodrich" cultures since the contamination, which shrouded its fine characteristics in regard to gas and indol production, was a simple colon bacillus. This was, therefore, the highly motile organization first noted by me at Ocean Springs, and which could only have been that of Sanarelli, or as was feared, one of the Proteus family, and therefore the earliest Sanarelli organism isolated after that author. Early in our effort to detect this new bacillus it was ascertained that its symbiosis with any member of the colon group materially influenced its marked motility, the germ seemingly becoming inhibited by the product of the colon organism both in growth and motility. Bearing this in mind it became an easier matter to detect it, and it was my fortune to isolate it from the cultures on hand in 42 per cent (*a*). Concomitantly with this work it was my especial effort to determine whether the bacillus icteroides was to be found in the blood or organs of bodies dead from *other* diseases than from yellow fever, and for this purpose I conducted at the city morgue, and more frequently at the morgue of the Hospital de Alphonso XIII, a number of necropsies (21), selecting bodies of patients who had suffered from malaria, with no suspicion of specific yellow fever, or from dysentery. With the exception of necropsy No. 6, none of these gave an organism approaching in characteristics that of Sanarelli, the majority of cases giving an admixture of colon and proteus in variety.

In this exception the organism isolated so fully met the demands of Sanarelli, in regard to its growth and physiologic aspects, that it was thought the bacillus had been found in this case of simple camp dysentery until on the fifteenth day it was found to be quite slowly liquefying gelatin 20 per cent in combination with 1 per cent agar. Further plating in effort to eliminate any contamination to which such liquefaction may have been due was prevented by our departure from

a A smaller per cent than if fresh culture examinations had been possible.

Habana. I could not differentiate the organism from that of Sanarelli when compared in living culture, or in stained preparation under the microscope, and it differed widely from the slowly liquefying proteus organisms. Its influence upon animal life I had no opportunity to test. During this time we had received notification of, and invitation to see, five cases of so-called yellow-fever—one through the courtesy of a private practitioner and four in military hospitals. Of these I differed in the diagnoses of two, the one in private hospital and one at the military hospital in Regla, a suburb of Habana. In the three others I concurred in the diagnosis. Fresh blood from the carefully cleansed ear-tip was taken in sterile glass bulbs, from each case after the manner of Sternberg, the capillary tube being at once sealed hermetically. It is a matter of moment that in each of the cases which I had diagnosed as yellow fever the organism was found by both of us, and fortunately in the one in which I failed to detect it it was detected by Dr. Geddings, and vice versa. In the two not thus diagnosed it was detected by neither of us, although especial effort was made to do so. While I do not wish to anticipate a colaborated report of the technical work performed in the laboratory at Habana, I will briefly state that from the organisms isolated by us from the home and foreign cultures, we demanded an absolute compliance with all the requirements of Professor Sanarelli in the case of his bacillus icteroides, as follows: An indefinite growth upon gelatin without its liquefaction; the same in sterile milk without precipitation of its casein; the nonproduction of gas from the decomposition of sugar, glucose or lactose, in bouillon (here it will be mentioned that all sugar tests were made with bouillon from which all muscle sugar had been extracted by a growth of bacillus coli communis for a suitable time, for in this it was found that bacillus icteroides, as obtained from the Institut Pasteur, and from our cultures, did not attack either glucose or lactose when added); the nonproduction of indol in faintest trace when dissolved by added chloroform; finally, the impossibility of inducing the property of indol production in this organism by limiting its nutriment to proteids for several successive generations. Except for its marked motility it is impracticable, otherwise, to determine the organism from the various members of the colon and proteus group. For the same reason, and because of the incompleteness of most of the observations and experiments, so suddenly interrupted and *not yet* resumed, I can only allude to the validity of the claim made by Professor Sanarelli, that the bacillus icteroides is the *cause* of yellow fever. My failure to find it in control necropsies, with the uncertain exception of necropsy No. 6; the fact of its presence in 42 per cent of native cases as evidenced by ourselves and by Professor Archinard (*a*), of New Orleans, as well as that of its more constant presence in foreign cases in the *possibility* of 100 per cent, make this organism and the claim made for it a most important one, and while there may be some reasons to an admission of the claim, it was the opinion of your commission, at the time of the interruption of its work, that it would require much time and labor in technical details to determine its true role in the pathogenesis of yellow fever.

It is a matter of serious regret that it was not considered of sufficient importance at the Bureau for this technical work to be at once continued in our service laboratory at Washington, in which event it would have been possible to have finished it, or nearly so, that a more

a Personal statement of a large per cent.

detailed report could have been made. As stated, this is intended only as a general report, showing the scope of and the amount of work performed by your commission in Habana, at times under conditions of excitement and apprehension but little calculated to produce that mental repose so necessary to such work.

In conclusion I must state that our Service is deeply obligated to Gen. Fitzhugh Lee, our consul-general at Habana, for counsel and advice and assistance at all times during our stay in Habana, for it was mainly due to his urbanity and gratefulness to the Spanish authorities that we were the recipients of so much courtesy from Captain-General Blanco and Secretary-General Congosto. The courtesies of General Pansano and of Colonel Marino, of the medical staff, were gratefully received. I must add my intense satisfaction in, and thorough appreciation of, the colaboratory work performed by Passed Assistant Surgeon H. D. Geddings, whose versatility was often evinced in the conduct of the work.

EUGENE WASDIN,
Surgeon, U. S. M. H. S.

WASHINGTON, D. C., *November 1, 1898.*

SIR: In presenting this preliminary report of the part taken by me in the investigation into the causes of yellow fever, I would beg leave to enter briefly into a review of the question up to the time that I entered upon the work in New Orleans and subsequently in Habana, Cuba, by your direction.

It is perfectly natural that a disease so well marked in its gross pathology and clinical history should, from a very early time, have afforded a field for minute investigation long before the time that the discoveries of Pasteur, Koch, and others changed the "germ theory" of disease into a system. With the advent of means of more correct investigation, with the discoveries of the specific cause of other infectious diseases as a guide, it was perfectly natural that a disease at once so peculiar and possessing so much interest for a large portion of the Western Hemisphere should form the subject of devoted study both in the United States and in Europe.

The alleged discoveries of Babes, Gibier, Domingos Friere, Carmona y Valle, and others have passed into almost oblivion, after having excited acrimonious controversy, and having been proved to be largely errors of interpretation, due mainly to faulty laboratory technique. The labors of Sternberg were arduous, systematic, and had as a result the clearing away of many erroneous impressions, and of inviting and fixing attention on the stomach, liver, and upper portion of the intestinal tract as the probable field of future research. In the meantime much labor had been expended upon the study of the micro-organisms of the normal intestinal canal, with the result that the subject was found to be one of vast dimensions, and involving at every turn the elucidation of new problems and bringing to light heretofore small but most important differences. As an instance of this, and as pregnant with the most important facts, has been the study of the bacillus coli communis, for a long time considered as a single, well-defined, normal, and harmless denizen of the intestinal canal of man and most of the lower animals. But the researches of Booker and others demonstrated that it would be impossible longer to consider this organism as a single species, and that it must be considered one of a great group, possessing

many characteristics in common, but at the same time presenting many points of difference, and these points not altogether morphological or cultural, but chemical and consisting in many instances in their behavior to reagents and media and in the chemistry of the products of their growth. It was notably the constant occurrence of organisms of this group which has lead to most of the announcements of the discovery of the specific organism of yellow fever; discoveries which, however, did not withstand the scrutiny to which such alleged discoveries must ever be subjected.

At the conclusion of Sternberg's investigations the organism which had most attracted his attention was one isolated in Habana, possessing some of the characteristics as then known and considered of the bacillus coli communis, but lacking others, which was pathogenic to animals, and which he designated as "bacillus X."

In 1897 there were presented at the Institut Pasteur in Paris two claims to the discovery of the specific organism of yellow fever, one from Havelburg of Rio de Janeiro, Brazil, the other from Professor Sanarelli of the University of Montevideo, both trained observers and both pupils of the institute. Their claims were widely different and it was obvious that one of the two claims must be rejected. This was not a matter of difficulty. Investigation showed that Havelburg had added one more to the number of those whose differentiation of the colon bacillus had not been sufficiently minute and painstaking. The claims of Sanarelli were more intricate. His theory of infection was new and elaborate, but unfortunately the percentage of cases in which his alleged bacillus icteroides was found was only slightly over 50 per cent.

Such was the status of the yellow fever question when I was ordered by you in October, 1897, to join Passed Assistant Surgeon Eugene Wasdin, United States Marine-Hospital Service, in New Orleans, and jointly with him to continue investigations into the etiology of the disease. On arriving in that city, I found that Dr. Wasdin had collected material from numerous necropsies and there was no lack of material. Our investigations were made in the bacteriological laboratory of the medical department of Tulane University, and we received much aid and many courtesies from Prof. P. E. Archinard, who at the time was engaged on the same subject. Very early it became evident that the published descriptions of Sanarelli as to the cultural appearances of his organism were vague, indefinite, and somewhat misleading. Always associated with the colon bacillus, it was a matter of great difficulty, often of impossibility to differentiate it from that organism. Resembling it in many particulars, it lacked certain of its characteristics, and possessed others of its own. Finally it was agreed that before an organism should be considered as that of Sanarelli it should have the following well-marked characteristics:

1. *Form.*—A small, rather fine bacillus, with rounded ends, and no tendency to fusiform shape, 1 to 2 micromillimeters in length, and about one-fourth as broad as long, occurring singly or in pairs, but never forming long chains from culture on solid media.

2. *Motility.*—Very actively motile, with individual organisms, making decided excursions, or translations, across the field of the microscope. (In this particular the bacillus icteroides of Sanarelli differs essentially from the colon bacillus, which, while motile, is sluggishly so, while the bacillus icteroides is fully as motile, or even more so, than the bacillus typhosus.)

3. *Gas production.*—In 2 per cent. lactose bouillon, not previously treated by the colon bacillus, an amount of gas production not exceed-

ing, as compared with the colon bacillus, the proportion of 1–4. In lactose and glucose bouillon, the muscle-sugar being destroyed prior to the addition of the lactose and glucose, by the growth of colon bacillus, *there is absolutely no production of gas.* (This is in great contrast with the colon bacillus, which produces a fermentation in both lactose and glucose bouillon, with abundant evolution of gases, having nearly or quite a definite chemical composition.)

4. *Production of acid.*—In litmus peptone solution a slight production of acid. (This is in marked contrast to the colon bacillus and the bacillus "X" of Sternberg, in which the production of acid is very marked, and much in excess of that of Sanarelli.)

5. *Production of indol.*—The bacillus icteroides of Sanarelli planted in Dunham's peptone solution after twenty-four hours gives absolutely no production of indol upon the addition of dilute sulphuric acid and sodium nitrite. (This is in specially marked contrast to both the colon bacillus and the bacillus "X" of Sternberg, the production of indol in the latter being very abundant and well marked.)

6. The bacillus icteroides of Sanarelli does not coagulate milk. Specimens from various sources have been kept under observation in milk for as much as sixty days. (Various members of the colon group differ much in the length of time required to produce coagulation of milk. In some, the change is produced in twenty-four hours; in some which have been under observation, nineteen days have elapsed before the change was complete.)

It is believed that these differences fully establish the fact that the bacillus icteroides of Sanarelli, while bearing a general resemblance to the colon group in morphology and cultural appearances, differs from it widely in the products of its growth and in its production of toxines.

As I have before said, much material was accumulated in New Orleans and much time was spent in the investigation of the organs and fluids from the bodies dead of yellow fever. Special attention was also given to the study for comparative purposes of cultures of the bacillus icteroides of Sanarelli, the bacillus "X" of Sternberg, and the ordinary colon bacillus. It can be safely said that the bacillus icteroides was found in a larger percentage of cases than had been claimed by Sanarelli in his series (58 per cent). A culture which possessed much interest was one which Dr. Wasdin had isolated from the blood of a living yellow fever patient at the detention camp at Fontainebleau, Miss., and which we always referred to in conversation as "bacillus Goodrich." Subsequently its identity with the bacillus of Sanarelli was almost incontestibly proved, so to Dr. Wasdin belongs the credit of having isolated and proved the first bacillus icteroides (Sanarelli) found in a genuine case of yellow fever on the North American continent.

About the middle of November, as the laboratory of the college would be required in a few days for the instruction of students, and a sufficient number of cultures from various sources having been collected, it was decided to suspend the investigations in New Orleans, and by order of the President, Dr. Wasdin and I proceeded to Habana, Island of Cuba, there to continue our investigations into the etiology of yellow fever. The season of the year was a little unfortunate, as, owing to the almost entire cessation of immigration into the island on account of the war, there was very little fever in the city, and the strained political relations existing between the United States and Spain, it was difficult to get access to the various military hospitals of the city, in spite of

official promises. The time, however, was by no means wasted. A laboratory was established in the same building with the United States consulate, and here the cultures collected in New Orleans were systematically studied, and such material as could be acquired in Habana was at the same time investigated. Unfortunately the New Orleans cultures had suffered from transportation and from delay in getting our work started, so they were comparatively few in number. The results, however, may be stated in brief as follows:

	Examined.	Positive.	Negative.
Cultures from—			
Spleen	2	2	0
Liver	8	6	2
Kidney	1	1	0
Blood	1	1	0
Habana cultures from blood	4	3	1
Total	16	13	3

NOTE.—The following is offered in explanation of the above results: There were originally 24 cultures secured in New Orleans and carried to Habana. On arrival there it was found that some had been broken in transportation; some had perished from drying, and all of these were rejected and no work was done on them in Habana. Surgeon Wasdin has also called my attention to the fact that the results in one case, Autopsy No. 18, were not quite conclusive and must, to a certain extent, be reworked.

Making a percentage of 76.93, in which the organism described by Sanarelli was found. Of course it would have been desirable to have had a larger number of cases, especially in Habana, but I think it will be conceded that a small number of cases carefully and exhaustively studied have more scientific value than a larger number more cursorily examined.

Experiments had been begun upon the toxines of the bacillus icteroides, both precipitated and liquid, when it became necessary to suspend the work in Habana and to return to the United States on the 15th of March, 1898, since which time further investigation has been prevented by other duties in connection with epidemic work in the Southern States.

It is here necessary to say a few words in connection with the claim of identity of the bacillus icteroides of Sanarelli and the bacillus "X" of Sternberg, which has recently been made. It is inconceivable to my mind how such a claim can be sustained by anyone who has carefully studied and differentiated the two organisms. The bacillus "X" is coarser, longer, and stouter than the bacillus icteroides; originally quite motile when isolated in Habana several years ago, it is now an organism, hardly as motile as the ordinary colon bacillus; in its growth it produces fermentation in both lactose and glucose agar, with a gaseous product quite similar in composition to the products of the colon bacillus; it produces acid in its growth; its production of indol is well marked and excessive, and lastly it readily coagulates milk. Indeed it would seem that the bacillus "X" is simply and solely a well marked and accentuated colon bacillus. It is pathogenic to be sure for rabbits, guinea pigs, and other of the lower animals, but the time has long since passed when the colon bacillus can be considered as harmless and non pathogenic.

It has also been objected that the bacillus icteroides too closely simulates the colon bacillus. To this it can only be said that in its characteristics of growth as previously detailed in this article, there is a wide difference, nor is its similarity nearly so great as is that of the

bacillus typhosus to the bacillus coli communis. The bacillus icteroides (Sanarelli) produces toxines, precipitable by ammonium sulphate, of well-marked intensity and potency, much more so than the toxines precipitated from bacillus "X" and ordinary colon bacillus.

The agglutination and arrest of motility experiments of Archinard and Woodson would seem to make the argument in favor of the pathogenicity of the bacillus icteroides all the stronger.

In concluding this preliminary and independent report which would indicate that the bacillus interoides of Sanarelli is the specific agent in the causation of yellow fever, I would beg to recommend that opportunity be given for further experimentation on lower animals with its toxines, and with cultures if necessary, and that both be tested in connection with the antiamaryllic serum prepared according to the methods of Sanarelli.

Very respectfully,

H. D. GEDDINGS,
Passed Assistant Surgeon, U. S. M. H. S.

THE CAFFERY BILL.

A BILL amending "An Act granting additional quarantine powers and imposing additional duties upon the Marine-Hospital Service," approved February 15, 1893.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled: That "An Act granting additional quarantine powers and imposing additional duties upon the Marine-Hospital Service," approved February fifteenth, eighteen hundred and ninety-three, be amended by striking out the following words in section one: "And with such rules and regulations of State and municipal health authorities as may be made in pursuance of or consistent with this Act," and striking out section three and inserting the following in the place of said section:

"SEC. 3. That immediately after the passage of this Act the Secretary of the Treasury shall make such rules and regulations as are necessary to prevent the introduction into the United States of any infectious or contagious diseases from any foreign port or place, or the spread of such diseases from one State or Territory, or the District of Columbia, into another State or Territory, or the District of Columbia, and such necessary rules and regulations as shall be observed by vessels or vehicles departing from foreign ports or places for ports or places in the United States to secure the best sanitary condition of such vessels or vehicles, their cargoes, passengers, and crews, which rules and regulations shall be published and communicated to and enforced by consular, quarantine, and customs officers of the United States and the State and local quarantine officers of the United States. All rules and regulations made by the Secretary of the Treasury shall operate uniformly, so far as climatic conditions will justify in the interest of the security against the introduction or spread of said infectious and contagious diseases, and shall not discriminate against any port or place. None of the penalties herein imposed shall attach to any vessel from a foreign port, or owner, or officer thereof, until a copy of this Act, with the rules and regulations made in pursuance thereof, has been posted up in the office of the consul or other consular officer of the United States for ten days in the port from which said vessel sailed, and the certificate of such consul or consular officer, over his official signature, shall be competent evidence of such posting in any court in the United States.

"At any port or place in the United States where the Secretary of

the Treasury shall deem it necessary for the prevention of the introduction of contagious or infectious disease from a foreign port or place that incoming vessels, vehicles, or persons shall be inspected by a national quarantine officer, such officer shall be designated or appointed by the Secretary of the Treasury on recommendation of the Surgeon-General of the Marine-Hospital Service, and at any such port or place no vessel, vehicle, or person from any foreign port or place shall be admitted to entry or enter without the certificate of said officer that the United States quarantine regulations have been complied with.

"Any vessel sailing from any foreign port without a United States consular bill of health, and arriving within the limits of any collection district of the United States, and not entering or attempting to enter any port of the United States, shall be subject to such quarantine measures as shall be prescribed by regulations of the Secretary of the Treasury, and the cost of such measures shall be a lien on said vessel, to be recovered by proceedings in the proper district court of the United States, and in the manner set forth above as regards vessels from foreign ports without bills of health, and entering any port of the United States.

"National quarantine stations now in operation shall be conducted in accordance with the provisions of this Act, and the Supervising Surgeon-General, with the approval of the Secretary of the Treasury, is authorized to designate and mark the boundaries of the quarantine grounds and quarantine anchorages for vessels which are reserved for use at each United States quarantine station; and any vessel, or officer of any vessel, or other person trespassing upon such grounds or anchorages, in disregard of the quarantine rules and regulations, shall be deemed guilty of a misdemeanor and subject to arrest, and, upon conviction thereof, be punished by a fine of not more than three hundred dollars, or imprisonment for not more than one year, or both, in the discretion of the court.

"And any master or owner of any vessel or any person violating any provision of this Act or any rule or regulation made in accordance with this Act, relating to inspection of vessels, or relating to the prevention of the introduction of contagious or infectious diseases, and any master, owner, or agent of any vessel making a false statement relative to the sanitary condition of said vessel or its contents, or as to the health of any passenger or person thereon, shall be deemed guilty of a misdemeanor and subject to arrest, and, upon conviction thereof, be punished by a fine of not more than five hundred dollars, or imprisonment for not more than one year, or both, in the discretion of the court.

"Medical officers of the United States, duly clothed with authority to act as quarantine officers at any port or place within the United States, and when performing such duties, are hereby authorized to take declarations and administer oaths in matters pertaining to the administration of the quarantine laws and regulations of the United States.

"The Secretary of the Treasury shall, whenever in his judgment it is necessary, make rules and regulations to prevent the introduction of infectious or contagious diseases into one State or Territory or the District of Columbia from another State, Territory, or the District of Columbia, and when such rules and regulations have been duly made they shall be promulgated by the Secretary of the Treasury and enforced by the sanitary authorities of the States and municipalities when the State or municipal authorities will undertake to execute or enforce them; but if the State or municipal authorities shall fail or refuse to enforce said rules and regulations, or other rules or regulations made under the provisions of this Act, the President shall execute and

enforce the same, and adopt such measures as in his judgment shall be necessary to prevent the introduction or spread of such diseases, and may detail or appoint officers for that purpose.

"Whenever yellow fever, cholera, plague, or typhus fever has passed the quarantines of the United States, or in any manner any one of these diseases has gained entrance or has appeared within the limits of any State, Territory, or the District of Columbia, the quarantine regulations of the United States, prepared under the direction of the Secretary of the Treasury, for the purpose of preventing the spread of such diseases from one State, Territory, or the District of Columbia into another State, Territory, or the District of Columbia, shall be supreme and have precedence of State or municipal laws, rules, or regulations, and the President is authorized to enforce the same and to control the movement of vessels, railway trains, vehicles, or persons so as to prevent these diseases from spreading from one State, Territory, or the District of Columbia to another State, Territory, or the District of Columbia, and to prevent unnecessary restrictions upon interstate commerce; and whenever, in accordance with the rules and regulations made as herein authorized to prohibit or permit the movement of vessels, railway trains, and vehicles, or transportation of persons, prohibitions or permits have been made or granted, any person violating said prohibition or permit shall be deemed guilty of a misdemeanor, and shall be subject to a fine of not more than one thousand dollars or imprisonment for not more than twelve months, or both, at the discretion of the court; and any violation of said prohibition or permit shall be reported to the United States district attorney for the district in which the offense has been committed, who shall thereupon institute necessary proceedings for the recovery of the penalty herein imposed."

That section six of said Act shall be amended to read as follows:

"That on the arrival of an infected vessel at any port not provided with the proper facilities for treatment of the same, the Secretary may remand said vessel, at its own expense, to the nearest national or other quarantine station where accommodations and appliances are provided for the necessary disinfection and treatment of the vessel, passengers, and cargo; and after treatment of any infected vessel, or inspection of any vessel not infected, at a national quarantine station, and after certificate shall have been given by the United States quarantine officer at said station that the vessel, cargo, and passengers are each and all free from infectious disease or danger of conveying the same, said vessel shall be permitted to enter and admitted to entry at any port of the United States named within the certificate. But at any ports where sufficient quarantine provision has been made by State or local authorities, the Secretary of the Treasury shall direct vessels bound for said ports to undergo quarantine at said State or local station."

That section eight of said Act shall be amended to read as follows:

"That whenever the proper authorities of a State shall surrender to the United States the use of the buildings, grounds, and disinfecting apparatus at a State or municipal quarantine station, the Secretary of the Treasury shall be authorized to purchase them at a reasonable compensation, or pay a reasonable rental for their use, if in his opinion they are necessary to the United States; and the expense of said purchase or rental is made payable from the epidemic fund.

"That the Surgeon-General of the Marine-Hospital Service shall, whenever he may deem it necessary, appoint in each port exposed to yellow fever, or where such disease has ever been introduced, a port

sanitary inspector, who shall have been a practicing physician for at least five years before his appointment at said port, and who shall be familiar with the symptoms of the disease hereinbefore mentioned, and skilled in its prevention and treatment.

"It shall be the duty of the port sanitary inspectors or quarantine physicians so appointed to make careful examination of the sanitary condition and surroundings of the ports where they reside and for which they are appointed, and to report each month, or oftener, if required so to do, the facts as to the sanitary condition of such ports to the Surgeon-General of the Marine-Hospital Service, with such suggestions and recommendations as they may think necessary and proper. The said port sanitary inspectors shall perform such other duties in treating yellow fever or other infectious diseases as the Surgeon-General of the Marine-Hospital Service shall direct; and they shall each be paid from the Treasury, upon vouchers signed by the Surgeon-General of the Marine-Hospital Service, the sum of one thousand dollars annually, payable, in equal quarterly installments, on the first days of January, April, July, and November.

Post-epidemic disinfection and house aeration.

[Copy of instructions sent to health authorities at all places infected with yellow fever in Louisiana and Mississippi.]

U. S. MARINE-HOSPITAL SERVICE,
New Orleans, La., October 29, 1898.

SIR: I send you a little circular, mailed also generally to the places where there has been fever.

In general, the white people, when the importance and efficiency of this measure is explained to them, and it is both, will carry it out voluntarily and at intervals during the winter.

With the negroes and certain classes of whites this will not be done, and what I would suggest and what has been done in previous years is that a town ordinance be passed directing this aeration "on such days as directed by the health officer." Appoint a man, generally town marshal, to see that it is carried out. Divide up the town into so many districts as may be necessary. Assign each one to a man subordinate to the marshal with police authority. Whenever proper weather occurs (we can generally tell the night before) let the health officer notify the marshal and the men go around and notify the householders. Go around again next morning and subsequent mornings and see that it is carried out. In a small place this plan has worked perfectly. In a large one it gives a large percentage of aeration.

It is of course only necessary to aerate the houses in which fever has occurred. A general aeration of fabrics, however, in bright weather, is an excellent hygienic measure, and will catch doubtful cases. Chemical disinfection, steam, formaldehyde, sulphur, or bichloride as needed, will be furnished by the Service to any place (house or houses) which seem to especially require it, and either myself or Dr. Clark, Assistant surgeon, will visit you to confer on this matter as soon as possible.

Respectfully, yours,

H. R. CARTER,
Surgeon, U. S. M. H. S.